KCFTOA
800 MHZ RADIO COMMUNICATIONS SYSTEM
Lesson Plan

Distributed By:

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COURSE SYLLABUS – AND – REQUIREMENTS

Location:	Variable
Course Dates:	Variable
Class Dates:	Variable
Class Days:	Variable
Class Times:	
Course Hours:	2 ½ Classroom
Frequency:	Annual
References:	Motorola MTS2000 Models II and III Portable Radio Operators Manual Valley Communications Eastside Communications King County Resource Guide Section 9 Seattle Communications Washington Administrative Code, 296-305-05001
Units of Instruction:	
Course Mission:	To provide training for fire officers and fire fighters on proper utilization of our 800 MHz radio communications system for emergency and non emergency radio traffic.
Course Vision:	To assist fire departments in meeting the requirements of NFPA 1500, and WAC 296-305 training fire personnel commiserate with the duties they are required to perform.
Course Description:	This class is designed as an overview to the 800 mhz radio system used by the three major dispatch centers in the county. The class includes a focus toward firefighter safety in recognizing limitations and alternative radio communication procedures built into the system. It also brings to the forefront the question, “What channels should the IC be prepared to monitor on the emergency scene?” This class can be supported by anecdotal reviews of prior structural fire incidents and the fire ground communications.

Course Objectives:

At the conclusion of the training session students will:

1. Be familiar with the 800 MHz radio communications system and prior radio history.
2. Understand the various components of the portable radio and base radio.
3. Be able to explain various radio signal noises (chirps, bonks, etc.)
4. Demonstrate methods to improve radio performance
5. Understand the use of the EMER button.
6. Demonstrate the ability to program the portable radio.
7. Demonstrate familiarity with switching talk groups (including interoperability with other zones and PD)
8. Demonstrate MAYDAY radio protocol
9. Verbally explain radio maintenance program.

Suggested Scenarios:

1. In a large commercial occupancy have the student demonstrate the ability to communicate outside the structure when his radio will not carry a signal by normal methods.
2. Given a portable radio have the student demonstrate programming the radio to monitor four talk groups (scanning). Have the student then demonstrate how to halt scanning without further programming.

	800 MHz Radio System	
	ADMINISTRATION	
Introduction	Introduce yourselves and provide your background and motivation for teaching the class.	**(5 min)**
Discuss	What has been their response (psycho/emotional) toward fire ground communications? Have they ever had an instance when they could not communicate? (other agencies) What communications did they believe they would engage in at the fire? What did they do to insure they were prepared in the event of communication failure?	(15-30 min)
	MOTIVATION	
Explain	This is one of the most dangerous occupations, more than 100 fire fighters die each year. According to the NFPA, one of the major causes of these fatalities was communications breakdowns. Knowing the full resource capabilities and limitations of their radio communications system is a means of reducing fire fighter fatalities.	**(5 min)**

	800 mhz radio communications	
Distribute The Pretest	• Be familiar with dispatch centers and field communications equipment. WAC 296-305 • Understand the difference between site trunking and use of repeater stations. • Given a developing fire operation, set up a communications plan. • Given a two zone response where does the EMERT notification go.	**(10 min)**
Explain		

Actions		Notes
Lesson Title:	**800 MHz Radio Communications**	
Level of Instruction:	2	
Objectives:	The student shall: Be familiar with the 800 MHz radio system Understand the various components of the portable radio, base radio, and dispatch center. Demonstrate the ability to program the portable radio Demonstrate familiarity with switching talk groups (including interoperability with other zones and PD Be able to explain various radio signal noises (chirps, bonks, etc.) Demonstrate methods to improve radio performance Understand the use of the EMERT button Demonstrate MAYDAY radio protocol Verbally explain radio maintenance program	
	Be able to explain various radio signal noises (chirps, bonks, etc.)	
Length of class:	**2 hours**	
Complete Workbook:	KC Fire Resource Plan Section 9 Note pages of power point	
Instructor Preparation:	Overhead Projector or PowerPoint Equipment (including screen) Easel and Easel Pad with Pens Several radios and dispatch center notification	

Actions	DAY 1	Notes
	Radio Communications	
Explain the bullets on the slide	History of radio communications. Problems of interoperability between neighboring jurisdictions with VHF. 1995 Adopted Regional 800mhz trunked radio network 2000 King County Resource Plan codified Begin explanation of area of coverage. Division of coverage. Subsystems setup for each dispatch center.	Slide #1 **Slide #2**
Explain the bullets on the slide Explain	**28 transmitter sites in the county wide system** **8 sites in the Valley Comm/King County system (Simulcast sites)** **3 intelli-repeaters in the KC/VC simulcast system** •Common Questions •Mobile radios keep cutting out while responding to calls: Shouldn't happen. Possible reasons would be bad contact at the push to talk button (PTT). Bouncing in your seat while trying to keep button pushed? ••What is the correct way to key mikes to eliminate above problem? It takes ~500ms for the zone controller computers to assign frequencies.	**Slide #3**

	Key the mike ahead of time accordingly. Train yourself to wait one second prior to to speaking. •Are these radios more efficient than the old radios? Yes, while you may not like them as well, they are definitely more efficient. They pool limited frequencies and allow use by many on various different talk groups. •BONKS! - How do you eliminate them? Reasons range, channel busy, poor signal, out of range. ••	

Actions	DAY 1	Notes
Ask	So how many “frequencies” site trunking How many talk groups? How many Users	<u>Answer:</u> Show slide 132 500 14,000
Slide show bullets	Simulcast sites (KC/VC, Seattle, EPSCA) Stand alone repeater sites Site trunking over 132 frequencies over 14,000 users over 500 Talk groups	**Slide #4**
Slide show description	Written explanation of location of repeater stations designed to provide coverage	**Slide #5**
	Geographical representation of site coverage locations	**Slide #6**
Slide show bullets	System built in redundancy. If controlling computers fail. System reverts to site trunking. Zone controlling computer failure All Talk groups default to Fire 1 unless site trunk Talk groups are setup For example Renton Fire has fire 1-7 set up for site trunking they are located at B bank positions 1-7. On the mobile radios RFD Admin is Site trunked and is located at position #27. <u>No Emer</u> button during site trunking No scanning during site trunking	**Slide #7**
Explain details of radio operations	Proper use of radios includes understanding the limitations and requirements of portable radio use. Common basic tasks and issues.	**Slide #8**

Slide show bullets	Key the mike and wait for the 2 quick beeps prior to speaking. This is the talk permit tone. No bedroom voices - speak loudly w/o yelling Microphones should be about 3"-5" from mouth, ¼" for Headsets!	
Explain	Take advantage of the carrier tail if possible to avoid re-acquiring frequencies from the zone controllers If transmitting near another radio, have the other radios volume turned way down, and or cover speaker. This will reduce feedback	
Ask	Radios are not indestructible. Cost and potential damaging actions. What is leading cause of radio damage?	
		Water damage and poor maintenance
Slide show bullets	The radios are NOT waterproof - delicate electronics inside are sensitive to moisture If you know you're going anywhere near a flowing sprinkler head, give your radio to someone who isn't! (Repairs run around $1500.00 repair, new radios are $2500.00) After the fire clean them up! (Damp rag, mild soap, toothbrush, toothpick) .	**Slide #9**
Discuss	Ask if anyone has experienced a radio transmission not going out? What sound occurred? What does it mean?	
Slide show bullets	BONKS Traffic is currently on the channel - The system will not let you talk over another unit. After getting bonked, you can talk after the radio gives you 2 quick chirps.	
	This means it's OK to talk.	**Slide#10**
	During heavy volumes of traffic, there may not be any frequency pairs available for use. You may be out of the range of the repeaters - below grade, metal buildings; large concrete structures can all block your radio signal.	

	Try to get near openings, windows, or doors -even turn your body, @ 3watts, it doesn't take much to block a signal	**Slide #11**
	Bonks cont. If you are working in an area that has poor radio operation. Consider and plan on using STATE OPS 1 or STATE OPS 4 for local communication. Always have someone monitor the Fire dispatch talk group and relay info to and from Dispatch to document events. This person would have to be outside the structure. City Hall, Renton High, Valley Medical are all excellent examples of when to use this tactic.	
Discussion	Fire fighters safety is of paramount importance. Rapid communication on the fire scene may at times be compromised by the number of units on scene and operational channels in use. Emergency Traffic may be requested by anyone any other situations that is considered of an emergency nature. What other safeguard is built into our communications system?	
		EMER BUTTON
Slide show bullets	Emergency Button An EMER Button press will take you automatically to EMER Z3 talk group.	**Slide #12**
	You will stay there until you reset the radio You obtain the highest priority for frequency allocation (Now a priority 1, Normal is 3, Disp. is 2) Instead of a 1 second carrier tail there is a 1 minute carrier tail.	

	You may also select the Emergency Zone 3 talk group by switching to A15. Once on the EMER Z3 talk group, Advise dispatch whether it's an true emergency or an accidental push If it's a true emergency declare a MAYDAY, and give as much info as possible regarding your Emergency If it's and accidental press, advise dispatch of the accident while on EMER Z3, give radio number, and wait to hear Valley Comm confirm it. Then you can reset <u>Refer back to slide #7 NO EMER BUTTON DURING SITE TRUNKING</u>	**Slide #13**
Discussion	Another useful feature when not responding is the ability to scan various talk groups. This feature can be programmed by the operator. It can also be turned on and off at the press of one button. Can anybody explain how this could be beneficial	BC to know who is and is not available and how calls are going, how busy the radio dispatchers are.
Slide show bullets	Scanning How to: Advantages -monitor calls Limits / Drawbacks - scan delays, uncertainty of	**Slide #14**

	the source of radio traffic Fires - Turn it OFF!	**Slide #15**
	Scanning on your portable radio	**Slide #16**
	View of front of portable radios.	**Slide #17**
		Slide #18
	Scanning face view and explanation of graphic symbols	**Slide #19**
	Explanation of buttons and use	**Slide #20**
Classroom activity	Scan button for programming Scanning on your mobile or base radio	
Slide show and students portable radios	Have class using their portable radios identify what channels they are currently scanning. Have class change, add, or delete channels to monitor. Once completed have them reprogram back to original configuration.	**Slide #21**
	Communicating with other non-fire agencies Examples of possible agencies City Police - RENTON PS (B-14) City or County Jail - STATE OPS 3 (C-3) City Public Works - REN-CITY (A-14) King County Sheriff - PSOPS S1(B9), PSOPS S2(B10) WSP – MARS (B15), mobile radio (pos #12) Airlift – Usually State Ops1 (simplex, A16) Mutual Aid Response Zone I When enroute and prior to switching talkgroups, Advise Valley Comm your switching to an Eastside Talkgroup.	**Slide #22**

	Then advise Eastside Dispatch that you are responding. Ex; VALLEY Eng 16 responding When dispatched determine talk group if not already advised. If you don't have it on your portable, advise host agency that we need to be patched via the MA ZONE 1 talk group. Zone 1 units responding into Zone 3 will either have our talk groups or be patched via MA ZONE 3. It will be seamless to Zone 3 users (won't notice outside agency is patched) Emergency Operations If the 800 crashes you may wish to use your VHF City frequency (154.100) on VHF radios. Also use State Ops Channels for short range communications. Portables (3 watts) will operate for a distance of about 3 blocks – line of site. Obstructions will reduce transmit distance. Mobile radios (35 watts) will transmit city wide. Also use civilian amateur radio	**Slide #23**
Classroom activity		Use board to show different programs of battery maintenance
Slide show bullets	Discuss maintenance program currently in use. Discuss familiarity with battery loading and discharge. How often is analysis on batteries performed? Who is responsible for radio batteries in the department?	**Slide #24**
	Batteries Brand new rating of 1500 milliamps hours 80% rating is the minimum allowed for use in Fire Ops. Any battery below this rating must be taken OOS and sent to department battery maintenance coordinator	**Slide #25**

Discussion	A replacement battery will be sent. Tri-analyze every 90 days minimum Guaranteed 1 year warranty. Departments with maintenance programs have been getting over 3 years so far! Batteries continued **800 mhz Radio Test** Name:_____ Emp#:_____ Date:_____ Choose the most correct answer for the questions below **1.** Where is the EMER button located? a) It's the blue button on the side b) It's the middle dot button on front c) It's the orange button on top **2.** How long after pressing the PTT button should you pause before speaking? a) 5 seconds b) 1 second c) 2 seconds **3.** STATE OPS Simplex channels are a good place to communicate when	

Slide show bullets	a) coverage on the regional system is poor? b) True c) False **4.** To exit the EMERGENCY mode, you should? a) Turn the Radio off, <u>after</u> confirming the event with dispatch on the EMER talk group b) Press the home button on front c) Press the orange button a second time **5.** The EMER button only works on _____ Talk groups. a) Repeated b) Trunked Repeated c) Simplex **6.** Simplex, or Direct communications means what? a) Simple radio to radio transmissions (walkie talkie) b) Direct repeater to repeater transmissions c) Satellite network communications **7.** Site Trunking means that the _____ has gone down. a) Zone Controller b) Radar c) Satellite **8.** How many Talk group banks does the MTS 2000 radio have in our department's configuration? a) 36 b) 45 c) 48 **9.** The difference between a Repeated and Trunked Repeated system is? a) range of communications b) capacity of communications c) Trunked repeated uses pairs of frequencies	

10. If my radio goes into Fail-soft or Site Trunking, I should.

a) hurl the radio as far as humanly possible!
b) call B.C. Moeller and give him the what for!
c) Switch to ST (*)talkgroups on Bank “B”

11. During Site Trunking, My EMER button will work as normal?

a) False
b) True

12. During Site Trunking, all Talk group Patches and Merges are lost?

a) False
b) True

13. My Radio has a Regional ID # that identifies me.

a) when I transmit or press the EMER button.
b) False
c) True
d) True, as long as I’m logged onto the CAD properly.

14. OPS 1, 2, and 3 talk groups are only monitored when.....?(not talking about recording)

a) There is traffic on them.
b) There is a working incident going on.
c) When Valley Com is requested to monitor.

15. The 800 Mhz Motorola MTS 2000 II radios cost approximately?

a) $875.00
b) $1750.00
c) $2500.00

16. If my radio gives me a Bonk tone, I should?

a) wait a second and the radio will give me a di,di,dit talk permit tone
b) replace my battery
c) feed it.

17. When transmitting over the 800 MHz system, the best way to be heard is to?

a) speak closely and clearly into the microphone
b) breath heavily into the microphone
c) key the PTT button about a half second before talking
d) both a and c

18. If my radio says “OUT OF RANGE” on the display.

a) I won’t be able to transmit
b) I can only reach the guy next to me
c) I’m probably out of King County or below grade in some building.
d) both a and c

19. Once I’ve logged my radio on to the CAD, can I swap it with someone else’s radio?

a) Yes
b) No

20. If I have any questions concerning the 800 MHz radios I should?

a) Refer to 800 manual on the “H” drive
b) Give the Training Division a call
c) Get my screwdriver out
d) Guess
e) Any of the above except for c and d
f)

21. A downed Firefighter should first attempt to call for help on normal talk groups before resorting to the EMER activation.

a) True
b) False

22. When transmitting with the radio, it is best to separate yourself from other radios, and or turn the other radios volumes down to avoid feedback

a) True
b) False
